

WINTER HABITAT SELECTION OF DIURNAL RAPTORS IN CENTRAL UTAH

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ABSTRACT - A total of 525 observations of 10 species was recorded during a winter roadside survey of raptors around Utah Lake, Utah Co., Utah. Six species; Red-tailed Hawk (*Buteo jamaicensis*), Rough-legged Hawk (*Buteo lagopus*), American Kestrel (*Falco sparverius*), Northern Harrier (*Circus cyaneus*), Golden Eagle (*Aquila chrysaetos*), and Bald Eagle (*Haliaeetus leucocephalus*); accounted for 493 (94%) of the observations. Red-tailed Hawks, Rough-legged Hawks and American Kestrels were found in greater than expected numbers in grassland habitat, Northern Harriers and Golden Eagles in sage/greasewood desert, and Bald Eagles in riparian/lakeshore habitat. Rough-legged Hawks predominantly used utility pole rather than tree perches; American Kestrels predominantly used wire perches; Red-tailed Hawks used tree and pole perches according to availability. All species, except American Kestrels, used areas away from centers of human activity more often than expected.

Ornithological literature contains relatively little information on the winter ecology of diurnal raptors (Newton 1979). Road surveys taken over several months can provide information on distribution, relative abundance and habitat use (Craighead and Craighead 1956; Bildstein 1978). This information may provide a basis for making land use decisions. Although many raptor road surveys have been conducted (Enderson 1965; Johnson and Enderson 1972; Craig 1978; Bauer 1982; Gessaman 1982), few have studied habitat or perch use in relation to availability, a prerequisite for making inferences concerning species preference or selection. Here, we conducted a road survey of wintering raptors and sampled the availability of general habitat types, specific perch types and proximity of centers of human activity along a 125 km census route. We then tested the (null) hypothesis that raptor use is in proportion to habitat availability. Where use of a particular habitat type was found to be significantly greater than expected, we infer selection or preference on the part of the species involved. Some argue that selection can only be demonstrated by detailed behavioral observations in which an active choice on the part of the animal is shown (see Morse 1980). We assume, however, that raptors are highly mobile organisms capable of moving from one habitat or perch type to another in a matter of minutes. Therefore, we infer an active choice on the part of the species if it occupies a particular habitat type significantly more often than could be expected by chance.

STUDY AREA AND METHODS

A 125 km loop around Utah Lake, beginning near Provo and terminating near Lindon, defined the census route (Fig. 1). Average elevation of Utah Valley is 1371 m. Mean annual precipitation ranges between 30.4 and 40.6 cm. Daily mean temperature during the period December-March ranged from approx. -15°C to 10°C. Vegetation was a mosaic of agricultural lands (irrigated and dry),



Figure 1. Map of census route, Utah County, Utah.

sagebrush (*Artemisia tridentata*) mixed with greasewood (*Sarcobatus vermiculatus*) desert, grassland/pasture, orchard, and riparian/lakeside woodland. Topography of the census strip was generally flat.

Twelve censuses totalling 42 h were conducted weekly from 8 January to 27 March 1983. Direction of travel along the census route was alternated each week. Roads on the east side of the lake were driven at speeds of 40 kph or less. Those on the west side, where there is little vegetation to impair vision and there are fewer potential raptor perch sites, were driven at speeds of 72 kph or less. Brief stops to identify birds and record data were sometimes made. Mean speed of travel per census was 36 kph. Mean time to complete a census was 3.45 h. The number of observers was usually 2, with 3 observers present on 2 occasions and a single observer present on 1 occasion.

Only those birds seen initially with the unaided eye were tallied. Binoculars and a 20x spotting scope were used to aid identification. For each sighting we recorded location, habitat type, behavior (flying, perched, hovering, soaring, coursing), perch site and distance from centers of human activity (farmyards, residences, commercial establishments, etc.). Habitat categories used were (1) cultivated farmland, (2) sage (cold desert including some greasewood), (3) grassland (including pasture and grass dominated rangeland), (4) riparian (including lakeside woods), (5) orchard, and (6) residential (including urban and commercial areas and the immediate area around farm and ranch houses). Perch

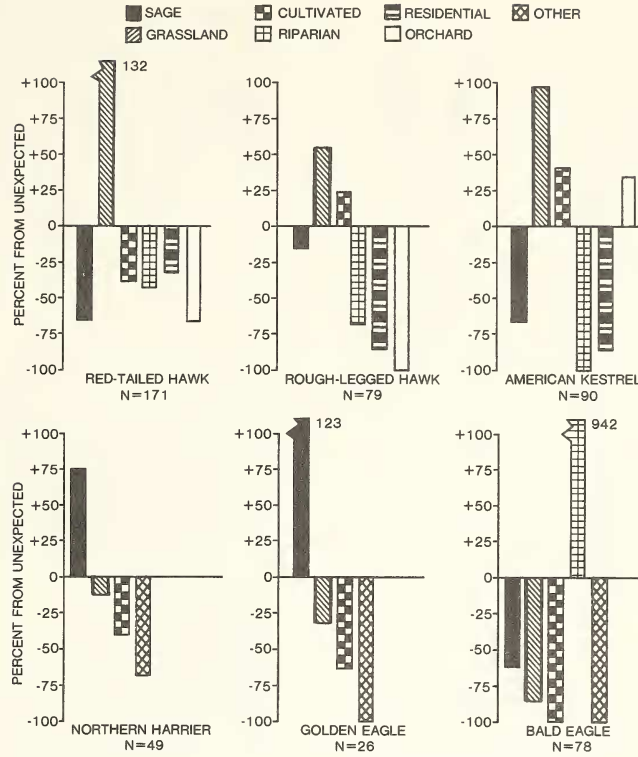


Figure 2. Percent deviation from expected number of raptor sightings by habitat type.

categories were (1) utility pole, (2) fence post, (3) wire, (4) tree, (5) shrub and (6) ground. Distance to human activity was recorded as (1) < 0.16 km, (2) 0.16 to 0.8 km, or (3) > 0.8 km.

Habitat and perch availability were quantified by assuming a census strip width of 1 km (0.5 km each side of road) for that portion of the route on the east side of the lake, and a width of 2 km (1 km each side of road) on the west side of the lake (Fig. 1). These strip widths reflected the maximum lateral distances at which we assumed nearly all raptors present could be spotted with the unaided eye. A random sample of 30, 200-m radius circular plots was taken to estimate the availability of each habitat and perch type within the census strip.

Data were analyzed using non-parametric Chi-square methods in which expected values were calculated from the estimates of relative availability of habitat factors. For example, if 25% of the census strip is cultivated farmland, we expect 25% of the sightings of Red-tailed Hawks to be in this habitat. Categories were lumped when expected values were less than 5 (Cochran 1954).

RESULTS AND DISCUSSION

A total of 525 raptor sightings was recorded on 12 censuses. Most frequently observed species with sample size sufficient to analyze were Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*), Rough-legged Hawk (*Buteo lagopus*), Bald Eagle (*Haliaeetus leucocephalus*), Northern

Harrier (*Circus cyaneus*), and Golden Eagle (*Aquila chrysaetos*). Species observed in smaller numbers were Prairie Falcon (*Falco mexicanus*), Merlin (*Falco columbarius*), Ferruginous Hawk (*Buteo regalis*) and Cooper's Hawk (*Accipiter cooperii*).

Habitat Use - Red-tailed Hawks were not randomly distributed among the 6 habitat types ($P < 0.01$) (Fig. 2). The observed number of birds in sage/greasewood desert was approximately a third of that expected, while the number found in grassland habitat was over twice that expected.

Rough-legged Hawks were also not randomly distributed among habitat types ($P < 0.1$). They were found at approximately the expected frequency in sage, more often than expected in grasslands and far less often than expected in developed areas (residential, etc.) (Fig. 2). This species breeds in remote, nearly treeless areas of the far north (Brown and Amadon 1968). Consequently it is not surprising that it prefers open habitat and shuns areas of intensive human activity.

Kestrels were also distributed non-randomly among habitat types ($P < 0.01$). They were found

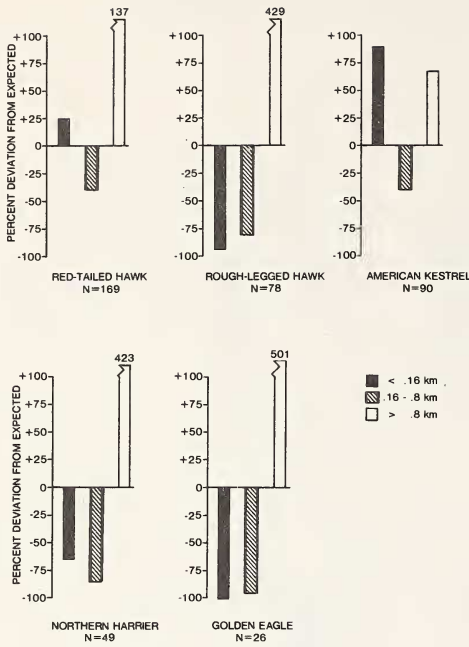


Figure 3. Percent deviation from expected number of raptor sightings by perch type.

twice as often in grassland as expected, but only one-third as often as expected in sagebrush (Fig. 2).

Of 4 habitat categories that could be considered (riparian, residential and orchard habitats lumped due to low expected numbers), Northern Harriers and Golden Eagles occurred more frequently than expected in sagebrush and less frequently than expected in all other habitats (Fig. 2).

Bald Eagles showed the most restricted habitat use pattern (Fig. 2). They were observed almost exclusively along the west shoreline of Utah Lake, and only where open water was nearby. Though the affinity of wintering Bald Eagles for open water is well documented (Fawks 1960; Southern 1963; Steenhof et al. 1980), most wintering Bald Eagles in Utah occur in sagebrush dominated desert valleys and subsist largely on carrion (Edwards 1969; Platt 1976). The narrow habitat choice found in this study is atypical of the normal habitat use pattern of the species in Utah.

Rough-legged Hawks, harriers, kestrels and, to a lesser extent, Red-tailed Hawks are known to prey heavily on cricetine and microtine rodents (Craighead and Craighead 1956). Only Northern Harriers occurred in expected or greater than ex-

pected numbers in the sagebrush habitat. The other species used grasslands more often than expected. Though we attempted no investigation of abundance and distribution of prey species, a previous study in central Utah reported similar numbers of rodents in sage-greasewood as in grassland habitat (Woodbury 1955). Thus, it appears the prey base of the grassland habitat supports more species and greater numbers of wintering raptors than does the prey base of the sagebrush desert. This may be due to greater vulnerability of prey to predation by diurnal raptors in grasslands than in the sagebrush. Furthermore, in the desert, where elevated perches are scarce, the aerial foraging of harriers may be more efficient than the perch and hover hunting strategies employed by Rough-legged Hawks and kestrels.

Perch Use - Raptor perches were primarily (83%) in trees or on utility poles. Rough-legged Hawks used poles more than expected ($P < .01$) whereas Red-tailed Hawks used tree and pole perches roughly according to their availability (Fig. 3). Schnell (1968) and Weller (1964) reported that Rough-legged Hawks tend to perch on poles and lone trees, while Red-tailed Hawks tend to select

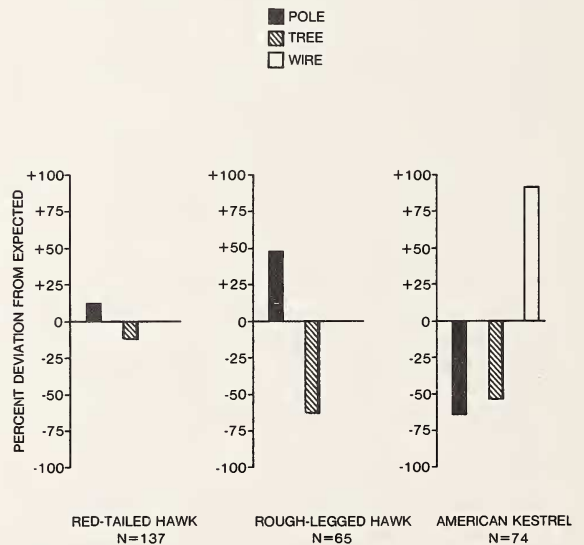


Figure 4. Percent deviation from expected number of raptor sightings by distance from centers of human activity.

perches in groves of trees and along wood edges.

Wires, a frequent (77% of total) perch of kestrels, were crudely quantified as being equal in availability to poles. Although the number of potential perch sites along an interpole length of wire is far greater than on a single pole top (or cross arm), we assume that the choice facing an individual kestrel is essentially a dichotomous one — pole or wire? Kestrels used wire perches more and poles and trees less frequently than expected ($P < .01$, Fig. 3). Bildstein (1978) also reported a preference of kestrels for wire perches.

Sixty-five of 66 perched Bald Eagles were in trees. Too few sightings of perched Golden Eagles and Northern Harriers were recorded to permit a statistical analysis of perch site preference.

Human Disturbance - Red-tailed and Rough-legged Hawks used undeveloped areas more than developed areas ($P < .01$, Fig. 4). Over twice as many Red-tailed Hawks were seen more than 0.8 km from human disturbance as would have been expected by chance alone. Only 12 of 79 (15%) observations of Rough-legged Hawks were within 0.8 km of human habitation. Interestingly, slightly more Red-tailed Hawks than expected were recorded within 0.16 km of centers of human activity. Large trees were often present around farmyards and ranch houses, whereas trees were often lacking nearby. The greater than expected number of Red-tailed Hawk sightings close to potential human disturbance may be due to a greater availability of perches. Rough-legged Hawks appeared not to use trees as readily as pole perches, and thus, did not perch as often as expected near centers of human activity. Alternatively, Rough-legged Hawks may be less tolerant of human disturbance than are Red-tailed Hawks, and the Rough-legged Hawk's use of poles may be due, at least in part, to the proximity of a large proportion of the study area's trees to human activity.

American Kestrels were distributed non-randomly also ($P < .01$). Almost twice as many kestrels were seen < 0.16 km from human activity as were expected (Fig. 4). Bildstein (1978) found that kestrels used areas nearer centers of human activity than did other raptors wintering in Ohio.

Northern Harriers, Golden and Bald Eagles were seen almost exclusively in undeveloped areas. Therefore, no statistical analysis of this trend was performed. These species seem to avoid developed habitat.

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Request for Information

Information is being gathered on the post-release behavior and survival of captive-reared and rehabilitated birds and mammals. The objectives of this study are to assess the amount and type of work that has already been done, to summarize the available data and evaluate techniques, and define the reasons for the survival or mortality of released animals.

Published and unpublished reports and raw data would be appreciated. For additional information, individuals willing to cooperate please contact Daniel R. Ludwig, Ph.D., Willowbrook Wildlife Haven, Forest Preserve District of DuPage County, P.O. Box 2339, Glen Ellyn, IL 60138.

Raptor Collisions with Utility Lines — A Call for Information — The U.S. Bureau of Land Management, Sacramento, in cooperation with the Pacific Gas and Electric Company, is assembling all available published and unpublished information concerning collisions of raptors with power lines and other utility lines. Actual case histories — no matter how circumstantial or fragmentary — are needed. Please acknowledge that you have such information by writing to Dr. Richard R. (Butch) Olendorff, U.S. Bureau of Land Management, 2800 Cottage Way, Sacramento, California 95825 U.S.A. (Phone (916) 484-4541). A form on which to record your information will then be sent by return mail.